

SEASONAL VARIATION OF DIATOMS AND MACROALGAE FROM STREAMS DRAINING ABANDONED AND RECLAIMED COAL MINES AND NON- IMPACTED SITES

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Ten streams along a gradient from acid mine drainage (2), reclaimed (6), clean streams (2) were sampled monthly for one year. The streams were placed into one of five categories according to the type of drainage received and regulation period under which strip mines were reclaimed (Table 1). Physical and chemical properties of the streams were measured and included the following: pH, conductance, aluminum, iron, manganese, sulfate, orthophosphate, nitrate, temperature, turbidity and current velocity. At each site macroalgae were evaluated over a 20-meter stream segment and voucher specimens collected. Diatoms were scraped from five rocks selected randomly from a riffle area. The diatoms were subsequently cleaned, identified and enumerated. For cluster analysis (not shown) and canonical correspondence analysis (CCA) data were grouped by season. Separate analyses were conducted on the diatom and macroalgal data sets. The significance of the first four CCA axes was tested utilizing Monte Carlo permutation tests (1000 permutations, $p = 0.05$). In the diatom analyses, the greatest amount of species variance was explained by the summer data set (85%), followed by the fall data (74.7%), spring data (47.9%) and the winter data (37.9%). Using the macroalgal data set the greatest amount of species variance was explained by the spring (72.4%) and fall data (70.2%). Spring (27 species) and fall (26 species) were the most species rich sampling seasons for macroalgae. In all CCA analyses, pH was highly correlated with the first axis, but current velocity, orthophosphate and sulfate were influential in

additional axes for particular seasons. Based on the algal analyses four groupings of streams were evident: AMD streams (BF, LH, DR), “teeter-totter” streams (MR, SC), intermediate water quality streams (UN1, UN2, MF) and clean streams (SR, WR). AMD streams seem to be characterized by a dominant flora of *Eunotia exigua*, *Frustulia rhomboides*, *Klebsormidium* sp. and *Microspora tumidula*. “Teeter-totter” streams fluctuate between acidic and circumneutral pH and have a greater abundance of *Brachysira vitrea* and *Fragilaria capucina* than other streams in this study. The diatom *Achnanthes minutissimum*, which is known to be a disturbance resistant taxon, dominated intermediate water quality streams. The relationship among stream water quality, macroalgal presence/absence, diatom community and reclamation regulation will be discussed.

Table 1. Stream names with corresponding abbreviations and initial site classification.

Stream	Category
Brush Fork	Still receiving AMD from abandoned strip mines.
Long Hollow	
Dorr Run	
Minkers Run	Draining strip mines reclaimed prior to 1972.
Un-named 1	Draining strip mines reclaimed prior from 1972-1982 under Ohio Revised Code 1513.
Scott Creek	
Mud Fork	Draining strip mines reclaimed after 1982 under SMCRA.
Un-named 2	
Spruce Run	Clean reference site
Wildcat Run	